CLAIMS

1. Use of a kinase as an indicator for validating a treatment process for reducing the amount or activity of a biological agent in a sample.

2. Use according to Claim 1, wherein kinase is immobilised in or immobilised on a solid support.

3. Use according to Claim 1 or 2, wherein the kinase is thermostable.

4. Use according to any of Claims 1-3 wherein the kinase is adenylate kinase, acetate kinase or pyruvate kinase.

5. Use according to any of Claims 1-4, wherein the kinase catalyses formation of ATP from a substrate comprising ADP.

6. Use according to any of Claims 2-5, wherein the solid support is a matrix and the kinase is dispersed within the matrix.

7. Use according to Claim 6, wherein the solid support comprises a polymer matrix.

8. Use according to any of Claims 2-7, wherein the solid support is an indicator strip, a dip stick or a bead.

9. Use according to any of Claims 1-8, wherein the indicator further comprises an agent to stabilise the kinase.

10. Use according to Claim 9, wherein the stabilising agent is selected from metal ions, sugars, sugar alcohols and gel-forming agents.

11. Use according to any of Claims 2-10, further comprising means to attach the support to a surface.

12. Use according to Claim 11, comprising a projection, recess or aperture for attachment of the support to a surface by means of a screw, nut and bolt or clamp.

13. Use according to any preceding claim, wherein the biological agent is an infectious biological agent and the treatment is for reducing the infectious activity of the agent.

14. Use according to any preceding claim, wherein the biological agent is a transmissible spongiform encephalopathy.

15. Use according to any preceding claim, wherein the treatment process comprises one or more of high temperature, high pH, high pressure, exposure to a protease, exposure to a detergent, a chemical sterilisation treatment or a gas-phase sterilisation treatment.

16. Use according to any preceding claim, wherein the treatment process comprises exposing the sample to a thermostable protease at a temperature of at least 60 degrees C and at a pH of at least 9.

17. Use according to any preceding claim, wherein the kinase has an amino acid sequence selected from the group consisting of SEQ ID Nos: 1-25 or is encoded by a nucleic acid sequence selected from the group consisting of SEQ ID Nos: 26-30.

18. A biological process indicator for validating a treatment process for reducing the amount or activity of a biological agent in a sample, comprising a kinase.

19. A biological process indicator according to Claim 18, further comprising a solid support, wherein the kinase is immobilised in or immobilised on said solid support.

20. A biological process indicator according to Claim 18 or 19, wherein the kinase is thermostable.

21. A biological process indicator according to any of Claims 18-20 wherein the kinase is adenylate kinase, acetate kinase or pyruvate kinase.

22. A biological process indicator according to any of Claims 18-21, wherein kinase has an amino acid sequence selected from the group consisting of SEQ ID Nos: 1-25 or is encoded by a nucleic acid sequence selected from the group consisting of SEQ ID Nos: 26-30.

23. A biological process indicator according to any of Claims 18-22, wherein the kinase catalyses formation of ATP from a substrate comprising ADP.

24. A biological process indicator according to any of Claims 19-23, wherein the solid support is a matrix and the kinase is dispersed within the matrix.

25. A biological process indicator according to Claim 24, wherein the support comprises a polymer matrix.

26. A biological process indicator according to any of Claims 19-25, wherein the support is an indicator strip, a dip stick or a bead.

27. A biological process indicator according to any of Claims 18-24, further, comprising an agent to stabilise the kinase.

28. A biological process indicator according to Claim 27, wherein the stabilising agent is selected from metal ions, sugars, sugar alcohols and gel-forming agents.

29. A biological process indicator according to any of Claims 18-28, further comprising means to attach the indicator to a surface.

30. A biological process indicator according to Claim 29, comprising a projection, recess or aperture for attachment of the indicator to a surface by means of a screw, nut and bolt or clamp.

31. A kit for use in validating a treatment process for reducing the amount or activity of a biological agent in a sample comprising:

(i) a biological process indicator according to any of Claims 18-30, and

(iii) substrate for the kinase.

32. A kit according to Claim 31, further comprising means for detecting ATP.

33. A kit according to Claim 32, further comprising luciferin/luciferase.

34. A kit according to any of Claims 31-33, further comprising a luminometer.

35. A kit according to any of Claims 31-34, further comprising a look-up table correlating the kinase activity of the indicator with the reduction in the amount or activity of the biological agent.

36. A kit according to any of Claims 31-35, for monitoring TSE inactivation.

37. A portable kit according to any of Claims 31-36.

38. A method of validating a treatment process, comprising:

(ii) obtaining a sample that contains, or is suspected to contain, a biological agent;

(ii) subjecting the sample to a treatment in the presence of a defined amount of a kinase, wherein the treatment reduces the amount or activity of the biological agent;

(iii) measuring residual kinase activity and optionally calculating the reduction in kinase activity; and

(iv) comparing said residual activity to a predetermined kinase activity, or comparing said reduction in kinase activity to a predetermined reduction in kinase activity, wherein the predetermined kinase activity or predetermined reduction in kinase activity corresponds to a confirmed reduction in the amount or activity of the biological agent under the same treatment conditions.

39. A method according to Claim 38, wherein the sample is known to contain the biological agent.

40. A method according to Claim 38 or 39, wherein the biological agent is an infectious biological agent, and the treatment reduces the infectious activity of the biological agent.

41. A method according to any of Claims 38-40, wherein the biological agent is a transmissible spongiform encephalopathy.

42. A method according to any of Claims 38-41, wherein the kinase is a thermostable kinase.

43. A method according to any of Claims 38-42, wherein the kinase is an adenylate kinase, an acetate kinase or a pyruvate kinase.

44. A method according to any of Claims 38-43, wherein the kinase has an amino acid sequence selected from the group consisting of SEQ ID Nos: 1-25 or is encoded by a nucleic acid sequence selected from the group consisting of SEQ ID Nos: 26-30.

45. A method according to any of Claims 38-44, wherein the treatment comprises one or more of high temperature, high pH, high pressure, exposure to a protease, exposure to a detergent or a chemical sterilant.

46. A method according to Claim 45, wherein the treatment comprises exposing the sample to a thermostable protease at a temperature in the range 50-120°C.

47. A method according to Claim 46, wherein the treatment comprises exposing the sample to the protease at a temperature of 60°C or above.

48. A method according to Claim 47, comprising exposing the sample to the protease at a pH of 9 or above.

49. A method according to any of Claims 38-48, wherein the kinase, prior to the treatment, has an activity of at least 10,000,000 Relative Light Units per mg kinase when measured in the presence of luciferin/luciferase by a luminometer.

50. A method according to Claim 49, wherein the kinase, prior to the treatment, has an activity of at least 5,000,000 Relative Light Units per mg kinase when measured in the presence of luciferin/luciferase by a luminometer.

51. A method according to Claim 50, wherein the kinase, prior to the treatment, has an activity of at least 1,000,000 Relative Light Units per mg kinase when measured in the presence of luciferin/luciferase by a luminometer.

52. A method according to Claim 51, wherein the kinase, prior to the treatment, has an activity of at least 500,000 Relative Light Units per mg kinase when measured in the presence of luciferin/luciferase by a luminometer.

53. A method according to Claim 52, wherein the predetermined kinase activity is less than 10,000 Relative Light Units per mg of kinase when measured in the presence of luciferin/luciferase by a luminometer.

54. A method according to Claim 53, wherein the predetermined kinase activity is less than 1000 Relative Light Units per mg kinase when measured in the presence of luciferin/luciferase by a luminometer.

55. A method according to Claim 54, wherein the predetermined kinase activity is less than 100 Relative Light Units per mg kinase when measured in the presence of luciferin/luciferase by a luminometer.

56. A method according to Claim 55, wherein the predetermined kinase activity is less than 10 Relative Light Units per mg kinase when measured in the presence of luciferin/luciferase by a luminometer.

57. A method according to any of Claims 38-56, wherein the predetermined reduction in kinase activity is equal to or greater than a 6-log reduction.

58. A method according to Claim 57, wherein the predetermined reduction in kinase activity is equal to or greater than a 7-log reduction.

59. A method according to Claim 58, wherein the predetermined reduction in kinase activity is equal to or greater than an 8-log reduction.

60. A method according to Claim 59, wherein the predetermined reduction in kinase activity corresponds to at least a 6-log reduction in the amount or concentration of kinase.

61. A method according to Claim 60, wherein the predetermined reduction in kinase activity corresponds to at least a 7-log reduction in the amount or concentration of kinase.

62. A method according to Claim 61, wherein the predetermined reduction in kinase activity corresponds to at least an 8-log reduction in the amount or concentration of kinase.

63. A method according to any of Claims 38-62, wherein the predetermined reduction in kinase activity corresponds to a reduction in Relative Light Units of at least 900,000 RLU.

64. A method according to Claim 63, wherein the predetermined reduction in kinase activity corresponds to a reduction in Relative Light Units of at least 990,000 RLU.

65. A method according to Claim 64, wherein the predetermined reduction in kinase activity corresponds to a reduction in Relative Light Units of at least 999,000 RLU.

66. A method according to Claim 65, wherein the predetermined reduction in kinase activity corresponds to a reduction in Relative Light Units of at least 999,900 RLU.

67. A method according to Claim 66, wherein the predetermined reduction in kinase activity corresponds to a reduction in Relative Light Units of at least 999,990 RLU.

68. A method according to any of Claims 38-67, wherein the confirmed reduction in the amount or activity of the biological agent is at least a 6-log reduction.

69. A method according to Claim 68, wherein the confirmed reduction in the amount or activity of the biological agent is at least a 7-log reduction.

70. A method according to Claim 69, wherein the confirmed reduction in the amount or activity of the biological agent is at least an 8-log reduction.

71. A method according to any of Claims 38-70, comprising measuring kinase activity prior to treating the sample and after treating the sample.

72. A method according to any of Claims 38-71, comprising treating the sample at 80°C for at least 10 minutes prior to measuring the residual activity of the kinase.

73. A method according to any of Claims 38-72, wherein measuring the residual activity of the kinase comprises adding a substrate comprising ADP to the residual kinase and measuring formation of ATP.

74. A method according to any of Claims 38-73, comprising continuing the treatment until the residual kinase activity or the reduction in kinase activity corresponds to a confirmed reduction in the amount or activity of the biological agent of at least 6 logs.

75. A method according to Claim 74, comprising continuing the treatment until the residual kinase activity or the reduction in kinase activity corresponds to a confirmed reduction in the amount or activity of the biological agent of at least 7 logs.

76. A method according to Claim 75, comprising continuing the treatment until the residual kinase activity or the reduction in kinase activity corresponds to a confirmed reduction in the amount or activity of the biological agent of at least 8 logs.

77. A method of correlating the reduction in the amount or activity of a biological agent in a sample with the kinase activity of an indicator according to any of Claims 18-30, comprising:

(i) preparing a sample containing a defined amount of the biological agent and a sample containing a defined amount of the kinase;

(ii) subjecting the sample(s) to a treatment;

(vi) measuring the residual activity of the kinase and optionally calculating the reduction in kinase activity;

(vii) measuring residual amount or activity of the biological agent and optionally calculating the reduction in the amount or activity of the biological agent;

(viii) repeating steps (i) to (v), wherein at least one of the treatment parameters is changed.

78. A method according to Claim 77, wherein the biological agent is an infectious biological agent and the treatment reduces the infectious activity of the agent.

79. A method according to Claim 77 or 78, wherein the biological agent is a transmissible spongiform encephalopathy.

80. A method according to any of Claims 77-79, wherein the treatment parameter comprises one or more of time, temperature, pH, pressure, protease concentration, and concentration of sterilant or detergent.

81. A method according to any of Claims 77-80, wherein:
the treatment comprises heating the sample(s) at a temperature of between 50-140°C, preferably 134-138°C;
the treatment parameter is time;
and wherein steps (i) to (iv) are repeated by subjecting the sample(s) to said treatment for periods of 1, 5, 10, 20, 40 and 60 minutes.

82. A method according to any of Claims 77-81, wherein
the treatment comprises exposing the sample(s) to a pH of 9-14, preferably about pH 12;
the treatment parameter is time;
and wherein steps (i) to (iv) are repeated by subjecting the sample(s) to said treatment for periods of 1, 5, 10, 20, 40 and 60 minutes.

83. A method according to any of Claims 77-82, wherein
the treatment comprises exposing the sample(s) to a protease at a concentration of 0.5-2 mg/ml, preferably 1mg/ml;

the treatment parameter is time;

and wherein steps (i) to (iv) are repeated by subjecting the sample(s) to said treatment for periods of 1, 5, 10, 20, 40 and 60 minutes.